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ARTIFICIAL INTELLIGENCE AND STAKEHOLDER-DRIVEN GST GOVERNANCE: ADVANCING SUSTAINABLE ECONOMIC DEVELOPMENT AND EVIDENCE-BASED PUBLIC POLICY

CA. SANDEEP SAHEBRAO SALVE
CA, CS, LLB, PGDORM, B.Com
Research Scholar
Email Id – Sandeep.Salve@ymail.com
DR. PRAKASH E. HUMBAD
CA, M.Com
Head, Department of Commerce and Research Centre
Mamasaheb Mohol College, Paud Road, Pune

Abstract: The growing complexity of the Goods and Services Tax (GST) framework in India has created a need for technologically advanced systems to improve compliance, transparency, and administrative efficiency. Artificial Intelligence (AI) has emerged as a transformative tool capable of strengthening tax governance through automation, data analytics, and intelligent decision-making. This study examines the role of AI in promoting stakeholder-driven GST governance and its potential to advance sustainable economic development and evidence-based public policy. It explores the application of AI technologies such as Optical Character Recognition (OCR), Natural Language Processing (NLP), Machine Learning (ML), Robotic Process Automation (RPA), chatbots, blockchain, and Facial Recognition Technology (FRT) in improving GST compliance, fraud detection, and tax administration. The findings indicate that AI-driven systems can enhance reporting accuracy, reduce compliance burdens, and support real-time monitoring of tax transactions. However, challenges relating to data privacy, regulatory oversight, and algorithmic accountability remain significant. The study concludes that responsible and well-regulated AI integration in GST governance can strengthen fiscal transparency, institutional efficiency, and sustainable economic development.

Keywords: Artificial Intelligence, GST Governance, Tax Compliance, Sustainable Economic Development, Evidence-Based Public Policy, Digital Tax Administration.

INTRODUCTION

The rapid expansion of digital technologies has significantly transformed governance systems worldwide. Governments increasingly rely on digital infrastructure to manage public services, regulatory frameworks and economic systems. Among emerging technologies, Artificial Intelligence (AI) has gained particular prominence due to its capacity to analyse large datasets, identify behavioural patterns and generate predictive insights that support policy decision-making.

In India, the importance of AI in governance has been recognised by several policy institutions. NITI Aayog's *National Strategy for Artificial Intelligence* emphasises the transformative potential of AI in addressing societal challenges and promoting economic growth. Although

the strategy does not specifically focus on taxation, it highlights the importance of robust regulatory frameworks and data protection mechanisms for responsible AI deployment across sectors.

Regulatory authorities in the financial sector have also begun monitoring the use of AI-based technologies. The Securities and Exchange Board of India (SEBI) has issued circulars requiring financial institutions to report their use of Artificial Intelligence and Machine Learning (ML). This initiative aims to create an inventory of AI-driven systems in financial markets and guide the development of future regulatory policies.

The Indian government has already demonstrated the practical value of AI and big data analytics in strengthening tax enforcement. In April 2023, AI-based analysis revealed more than 300 shell companies operating within a small geographical area that had fraudulently claimed tax refunds amounting to approximately Rs. 400 crore. Through advanced data analytics, authorities were able to identify financial linkages among these entities and uncover patterns of tax evasion.

Similarly, in October 2023, AI-assisted economic offence analysis enabled coordinated Income Tax raids across multiple locations. These investigations relied on large-scale data analytics to track complex financial transactions among shell companies.

Recognising the strategic importance of AI, the Government of India launched the IndiaAI Mission in March 2024 with a budget allocation of Rs. 10,371.92 crore. The mission aims to strengthen India's AI ecosystem and promote responsible integration of AI in governance, regulatory oversight and compliance systems.

These developments are particularly relevant for the Goods and Services Tax (GST) system. Introduced in 2017, GST represents one of the most significant structural reforms in India's indirect taxation system. The reform replaced multiple indirect taxes with a unified national tax structure and relies heavily on digital infrastructure managed by the Goods and Services Tax Network (GSTN).

Despite its achievements in improving tax transparency and revenue mobilisation, GST continues to face challenges related to compliance complexity, reconciliation of input tax credits and dispute resolution. Given the massive volume of transactional data generated within the GST system, AI presents a significant opportunity to enhance tax administration efficiency and strengthen regulatory oversight.

Against this backdrop, this research paper examines how AI-driven technologies can improve GST governance by enhancing compliance monitoring, facilitating stakeholder engagement and supporting evidence-based policy design.

RESEARCH OBJECTIVES

This research aims to:

- Examine the role of AI driven technologies in enhancing GST compliance through automated data processing, monitoring and predictive analytics.

- Explore the potential of AI in fraud detection and risk assessment within the GST framework, particularly in identifying anomalies, shell transactions and tax evasion patterns.
- Assess the effectiveness of AI driven automation tools in GST administration, including technologies such as Machine Learning, Optical Character Recognition and Robotic Process Automation.
- Identify the key challenges associated with the implementation of AI in GST compliance and administration, including technological, regulatory and institutional constraints.
- Provide policy recommendations based on the findings of the study to support the responsible and effective integration of AI in GST governance.

RESEARCH METHODOLOGY

This research adopts a qualitative and conceptual research design supported by secondary data analysis to examine the role of AI in GST governance and compliance.

- **Literature Review –** Academic publications, policy reports and government documents are analysed to understand the role of AI in taxation systems and digital governance.
- **Policy and Institutional Analysis** – Government initiatives, regulatory frameworks and institutional reports related to AI adoption in tax administration are examined.
- **Technology Application Review** – The study analyses the potential role of AI technologies such as OCR, NLP, Machine Learning, RPA, blockchain and chatbots in improving GST compliance and administration.
- **Secondary Data Analysis** – Information from government releases, official statements and policy documents is used to assess the impact of AI-driven analytics on tax enforcement and compliance monitoring.

ARTIFICIAL INTELLIGENCE AND SUSTAINABLE DEVELOPMENT

Artificial Intelligence (AI) is widely recognized as a transformative technological innovation with significant implications for governance, economic systems, and sustainable development. The National Artificial Intelligence Act of 2020 defines artificial intelligence as *"a machine-based system that can, for a given set of human-defined objectives, make predictions, recommendations or decisions influencing real or virtual environments."* Similarly, the Association for the Advancement of Artificial Intelligence describes AI as *"the computational study of intelligent behavior, including areas such as reasoning, learning, perception and language understanding."* These definitions emphasize the ability of AI systems to analyse large datasets, recognize patterns, and support informed decision-making across various sectors.

In parallel, the concept of sustainable development focuses on achieving economic growth while ensuring long-term social and environmental well-being. The widely accepted definition

originates from the Brundtland Report of the World Commission on Environment and Development, which defines sustainable development as *"development that meets the needs of the present without compromising the ability of future generations to meet their own needs."* This framework highlights the need for economic progress that is balanced with responsible resource management, institutional accountability, and inclusive development.

The significance of sustainable development has been further reinforced by the United Nations through the adoption of the Sustainable Development Goals (SDGs), which aim to promote inclusive economic growth, strong institutions, and technological innovation. Within this global agenda, Artificial Intelligence has increasingly been recognized as a powerful enabler capable of supporting several SDGs, particularly those relating to economic productivity, institutional governance, and technological advancement.

In the context of public policy, AI provides governments with advanced analytical tools that can process complex socio-economic data and generate insights for more informed decision-making. Technologies such as predictive analytics enable policymakers to forecast economic trends, identify regulatory risks, and evaluate the potential outcomes of policy interventions. As a result, AI supports the development of evidence-based public policies that are more adaptive, transparent, and responsive to societal needs.

Within taxation systems, sustainability refers to the ability of fiscal frameworks to generate stable public revenue while maintaining fairness, efficiency, and transparency. AI technologies can significantly contribute to sustainable taxation by improving compliance monitoring, detecting fraudulent activities, and reducing administrative inefficiencies. By automating data analysis and identifying irregular patterns in financial transactions, AI enhances the capacity of tax authorities to manage complex taxation systems effectively.

In the context of the GST framework, AI-driven analytics can assist tax authorities in identifying compliance gaps, monitoring sector-specific economic trends, and evaluating the impact of taxation policies across industries. These capabilities enable policymakers to design targeted interventions that improve compliance while supporting long-term fiscal stability and sustainable economic development.

To better understand this relationship between AI-enabled governance and sustainable development, it is necessary to examine the role of the GST framework itself in promoting economic growth and fiscal transparency.

DIGITAL TRANSFORMATION IN GST ADMINISTRATION

Digital transformation has become a central component of contemporary tax administration. The GST framework relies heavily on digital infrastructure to manage tax filings, invoice reporting and compliance monitoring.

The GSTN platform processes millions of invoices and tax returns every month, generating vast volumes of economic transaction data. Analysing this data through traditional manual methods is both time-consuming and inefficient.

Artificial Intelligence provides the analytical capacity required to process such datasets effectively. Machine learning algorithms can identify patterns in transaction data, detect anomalies and predict potential compliance risks.

Digital transformation also facilitates improved interaction between taxpayers and tax authorities through online portals and automated support systems. Integrating AI-driven tools into these systems can further enhance service delivery by providing real-time compliance guidance and intelligent advisory support.

Within this broader context of digital transformation, several specific AI technologies can be applied to strengthen GST administration.

AI TECHNOLOGIES SUPPORTING GST COMPLIANCE AND ADMINISTRATION

The introduction of the GST has significantly transformed the taxation framework by seeking to establish a more integrated and transparent indirect tax system. Despite these reforms, several challenges persist, including intricate compliance procedures, fraudulent activities, discrepancies in ITC claims, and inefficiencies within administrative processes. Conventional tax administration systems largely depend on manual operations, which can be time-intensive, prone to human error, and vulnerable to instances of tax evasion. In this context, AI is increasingly recognized as a powerful technological tool capable of strengthening GST administration and compliance through automation, advanced data analytics, and intelligent decision-support systems that improve both efficiency and accuracy.

1. Optical Character Recognition (OCR)

Optical Character Recognition (OCR) is a technology that enables machines to identify and convert text from scanned documents, images, or handwritten materials into machine-readable data. Within the GST framework, OCR is widely used to automate the extraction of key information from invoices, receipts, and other financial records.

AI-enhanced OCR systems not only recognize characters but also understand the layout and structure of documents. This allows them to automatically extract important GST-related fields such as the GST Identification Number (GSTIN), invoice numbers, supplier details, tax rates, and total tax amounts. By automating data capture from invoices, OCR reduces manual data entry errors and significantly speeds up compliance processes.

For instance, businesses can scan incoming invoices using AI-powered OCR tools that automatically identify GST-related information such as CGST, SGST, or IGST amounts. This capability allows organizations to process large volumes of financial documents efficiently, streamline tax reporting, and improve the accuracy of GST filings.

2. Natural Language Processing (NLP)

Natural Language Processing (NLP) enables computers to understand and analyse human language in text or speech form. In GST administration, NLP is particularly useful for interpreting unstructured data contained in invoices and financial documents that may vary in format and description.

AI-based NLP models can analyse invoice descriptions, extract relevant information, and classify goods or services into appropriate tax categories. For example, NLP tools can interpret product descriptions in invoices and automatically map them to the correct GST classification and applicable tax rates.

While OCR focuses on converting text into machine-readable format, NLP interprets the meaning and context of that text. Together, these technologies automate invoice analysis, reduce classification errors, and ensure more accurate GST compliance and reporting.

3. Machine Learning (ML) and Deep Learning

Machine Learning (ML) and Deep Learning are AI technologies that enable computer systems to learn from data and improve decision-making without explicit programming. ML algorithms analyse historical data to detect patterns and anomalies, while Deep Learning uses neural networks to process more complex datasets.

In GST compliance, ML models can analyse invoice data to detect inconsistencies, identify mismatches between purchase records and tax filings, and flag potential errors before returns are submitted. Deep Learning further enhances these capabilities by identifying complex fraud patterns and irregular financial behaviour.

These technologies also assist with processes such as GSTR-2A and GSTR-2B reconciliation by predicting possible invoice mismatches and highlighting missing data. As a result, businesses can correct discrepancies in advance, improving the accuracy and efficiency of tax compliance.

4. Robotic Process Automation (RPA)

Robotic Process Automation (RPA) uses software bots to automate repetitive and rule-based tasks that are normally performed manually. These bots can replicate human actions such as logging into systems, downloading files, entering data, and comparing records.

In the GST environment, businesses frequently need to retrieve data from tax portals and reconcile it with internal records. RPA can automatically access the GST portal, download reports such as GSTR-2A or GSTR-2B, and compare them with company purchase records. Any discrepancies, such as missing invoices or incorrect values, can be flagged for review.

By automating these routine tasks, RPA improves efficiency, minimizes human error, and reduces administrative workload. This allows tax professionals to focus on analytical and strategic functions rather than repetitive data processing.

5. AI-powered chatbots and virtual assistants

AI-powered chatbots and virtual assistants are increasingly used to support GST-related compliance and tax management. Chatbots typically handle specific queries using rule-based systems or basic machine learning models. For example, they can answer questions related to GST filing deadlines, tax rates, or return procedures.

Virtual assistants are more advanced and use technologies such as NLP and ML to provide personalized support. They can guide businesses through complex compliance processes, assist in invoice reconciliation, monitor filing deadlines, and help generate GST reports.

These AI-driven support systems operate continuously and can integrate with accounting or ERP software to provide real-time insights. By automating routine interactions and assisting with compliance tasks, they reduce manual effort and improve accuracy in tax management.

6. **Facial Recognition Technology (FRT)**

Facial Recognition Technology (FRT) is a biometric system that identifies individuals by analysing distinctive facial features. It compares captured facial images with stored records to verify identity.

In GST registration processes, FRT can be integrated with Aadhaar-based authentication to verify the identity of applicants. By matching a live facial image with official records, the system helps prevent identity fraud and unauthorized registrations. This enhances the security and reliability of the GST registration process while supporting more efficient compliance verification.

7. **Blockchain**

Blockchain is a decentralized digital ledger that records transactions securely across a distributed network. Once information is recorded, it cannot be altered without network consensus, ensuring data integrity and transparency.

In GST compliance, blockchain can enhance invoice authentication, reduce fraudulent ITC claims, and improve transaction traceability. By maintaining immutable records of invoices and financial transactions, blockchain enables both businesses and tax authorities to access reliable transaction histories.

Integration with Enterprise Resource Planning systems such as SAP and Tally can automate GST data recording and validation. This reduces manual intervention, improves reconciliation accuracy, and facilitates timely tax filings. Overall, blockchain strengthens transparency, reduces tax evasion risks, and supports a more accountable GST ecosystem.

ARTIFICIAL INTELLIGENCE IN GST LITIGATION AND DISPUTE RESOLUTION

The implementation of GST has led to a growing number of disputes concerning tax classification, ITC eligibility and procedural compliance. Efficient dispute management is essential for maintaining trust in the tax system.

Artificial Intelligence can significantly enhance litigation management through predictive analytics and automated legal research.

AI-based legal analytics tools can analyse historical court judgments and identify patterns in case outcomes. Predictive models can estimate the probability of success in litigation based on legal precedents and case characteristics.

Additionally, AI-assisted research tools can process large volumes of statutes, notifications and judicial decisions, enabling faster identification of relevant precedents. By identifying recurring dispute patterns, AI can also assist policy makers in revising regulations and reducing litigation over time.

FINDINGS, RECOMMENDATIONS AND CONCLUSION

This study highlights the transformative potential of AI in strengthening Goods and Services Tax (GST) governance and improving tax administration systems. The findings indicate that AI-driven technologies significantly enhance the efficiency, accuracy, and transparency of GST compliance processes. Through automation and intelligent data processing, AI minimizes human errors in tax filings, invoice reconciliation, and compliance verification. Technologies such as machine learning, advanced analytics, and anomaly detection algorithms enable tax authorities to detect suspicious transaction patterns, identify shell entities, and curb tax evasion more effectively.

The integration of tools such as Robotic Process Automation (RPA), AI-enabled analytics, and chatbot-based taxpayer assistance further streamlines GST return filing, improves taxpayer engagement, and reduces administrative burdens for both businesses and regulatory authorities. These technologies facilitate faster data processing, real-time monitoring, and improved communication between tax authorities and taxpayers, thereby strengthening administrative efficiency and transparency in the tax ecosystem.

From the perspective of sustainable economic development, AI-enabled GST governance contributes to stronger fiscal systems by improving tax compliance and ensuring more efficient revenue collection. Effective tax administration enables governments to mobilize public resources more reliably, which can be directed toward infrastructure development, social welfare programs, and economic growth initiatives. By promoting transparency and reducing tax leakage, AI-driven governance systems support the creation of accountable and resilient public institutions that are essential for sustainable economic development.

However, the study also identifies several ethical and regulatory challenges associated with the adoption of AI in public taxation systems. Concerns regarding data privacy, algorithmic transparency, and accountability remain critical issues in the integration of AI technologies within government frameworks. In addition, the absence of comprehensive regulatory guidelines governing AI deployment in tax administration creates potential risks related to governance oversight and responsible data usage.

To address these challenges and ensure the responsible integration of AI within GST governance, several strategic recommendations emerge from this research:

- Adoption of AI-based fraud detection and risk assessment tools by tax authorities to strengthen real-time monitoring, predictive analytics, and enforcement capabilities within the GST framework.
- Development of clear regulatory frameworks establishing standards for data governance, algorithmic accountability, and ethical use of AI in public taxation systems.

- Promotion of stakeholder-driven governance models through collaboration between government agencies, technology developers, financial institutions, and academic institutions to co-develop transparent and reliable AI-based compliance solutions.
- Investment in digital and technological infrastructure, including cloud computing and big data analytics platforms, to support secure and scalable processing of GST-related data.
- Capacity-building and AI literacy initiatives for tax professionals and regulatory authorities to facilitate informed decision-making and responsible adoption of AI technologies.

The integration of AI within GST governance also aligns with the broader global agenda for sustainable development articulated by the United Nations through the Sustainable Development Goals. In particular, AI-enabled tax administration supports SDG 16 (Peace, Justice and Strong Institutions) by strengthening institutional transparency and accountability, while also contributing to SDG 8 (Decent Work and Economic Growth) through improved fiscal governance and efficient revenue mobilization.

In this context, the "Responsible AI for All" framework proposed by NITI Aayog provides an important policy foundation for balancing technological innovation with public accountability.

Ultimately, the responsible integration of AI within stakeholder-driven GST governance frameworks has the potential to strengthen evidence-based public policymaking, enhance fiscal transparency, and foster a resilient taxation ecosystem that supports inclusive and sustainable economic development.

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